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exists between the suspensor of a bird's mandible and the small bones of the human ear.

I find in the lobster a structure which is probably homologous with the endocranium of insects. It is an opademe running like a bulk-head across in rear of the rostrum, consisting of a central cross bar, and on each side two free plate-like wings. Under its central bar is the frame work which supports the stalked eyes. Its hinder surface gives attachment to muscles which reach the stomach. It is described by Huxley (*Anatomy of the Invert.*, p. 274, of American edition) as the opademe of the ophthalmic samite.

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SKETCH OF PROGRESS IN MAMMALOGY IN THE UNITED STATES IN 1879.

BY DR. ELLIOTT COUES, U.S.A.

THE year past has seen very little progress in our knowledge of recent Mammalia, so far as contributions to that subject in the United States are concerned. Mr. J. A. Allen, one of the recognized leaders, has apparently been too busy with his great work on seals (now in press and about half printed) to do much else in mammals, and the present writer's labor in the same field has been confined to the "History of North American Mammals." The latter is still too far from completion to speak about; but Mr. Allen's *Pinnipedia* may be expected to appear very shortly, doubtless in 1880. Having the supervision of its publication in its passage through the press, the writer is in position to speak confidently of its merits and importance. It will make an octavo of perhaps 800 pages, illustrated with numerous wood engravings, mostly original; and will unquestionably become at once *the* work upon the subject. In thoroughness of treatment, accuracy and extent of investigation, and other requirements of masterly workmanship, it will compare with the author's celebrated memoir on the American bison.

As Prof. Leidy has done nothing during the year, either in fossil or living mammals, the field of the former has been left to Mr. Marsh and Mr. Cope, whose important contributions are noted beyond.

Certainly the most notable and perhaps the most significant paper on mammals of the past, present and, we may add, of the

future, is Mr. Cope's, "On the genera of Felidæ and Canidæ," in the Proceedings of the Philadelphia Academy, giving the author's views of their primitive types and of the successive steps through which they have passed, with detailed characters of the genera, including several new ones, and a nominal list of the species of both families. In the Felidæ, Mr. Cope recognizes altogether fourteen genera (including *Cryptoprocta*, between *Smilodon* and *Pseudæchurus*) and ninety species—which are probably too numerous in the genera *Felis* and *Lyncus*, as the author remarks. In adopting *Uncia* of Gray as a generic term, the author assumes it to be derived from *Uncus*, a hook, but is it anything more than "ounce" in Latin? *Dinictis cyclops* n. sp., is fully described, p. 176. The interest of this paper perhaps centers about *Synagodus mansuetus* and *Dysodus pravus*, two new genera and species founded upon before-supposed varieties of *Canis familiaris*. Of the *Synagodus* it is stated to be "uncertain whether any species of this genus exists in a wild state. Should such not be the case, we can only predicate the former existence of such an one as entirely different from the *Canis familiaris*, and which has given origin to the existing one." *Dysodus pravus* is the Japanese lap dog. These are regarded as "the most specialized of the *Canidæ*." In this connection the author refers to the frequently-observed reduced dentition of man, and reasons from "what is elsewhere known in zoölogy, that the same or nearly the same specific characters may be found in different genera," that different genera may be found in the same species, which becomes a different species upon the circumstance of being referred to a new genus. Two hypothetical genera of *Hominidæ* to "be at some future day added to *Homo*," are named and described in anticipation of the establishment as a generic character of certain dental peculiarities, namely: *Metanthropos* with incisors $\frac{1}{2}$, and *Epanthropos* with molars $\frac{3}{2}$. The species of these genera, left unnamed, may be provisionally designated respectively *M. incipiens* and *E. procul*, with reference to their extremely primitive state of possible accomplishment. Much might be said, doubtless, for and against the availability of names proposed for conjectural species *in futuro*. The logical extreme of the procedure might be a potential *Pseudanthropops gingivatus*, that is, an hypothetical anthropomorphic super-simian without canines; the dental formula of which would be, according to our inference and our ignorance, I. ?, C. $\frac{0}{0}$, Pm. ?, M. ?. The new spe-

cies of *Canidæ* of this paper are *Temnocyon coryphæus* and *Icticyon crassivultus*:

In the same part of these Proceedings (April–October) Mr. H. C. Chapman describes the placentation of *Macacus cynomolgus*, and an earlier one by the same author is on the anatomy of the Chimpanzee, illustrated with four plates. Mr. John A. Ryder continues from his paper of 1878 (pp. 45–80) his notes on the mechanical Genesis of tooth forms, seeking to show the modes in which the teeth of mammals are modified by movements of the jaws in mastication, through a long series of generations; reaching the conclusion “that mechanical strains and impacts had probably been the secondary causes to which the origin of the various forms of teeth might, in a large measure, be attributed.” He here offers some new evidence based upon more accurate observations of the mode in which herbivorous ungulates masticate their food. In the same line of research, Mr. Cope has a paper on the origin of the specialized teeth of the Carnivora, in the NATURALIST for March, 1879, p. 171.

Other articles on recent Mammalia by the same author in the same journal, are on the California gray whale, p. 655; on the Japanese lap dog, p. 655, and a paper on the zoölogy of Montana, p. 433. Various other brief articles or notes on mammals in the NATURALIST need not be more than alluded to here.

The Bulletin of the United States Geological Survey contains two important papers, by Mr. Allen, on the genera *Nasua* and *Bassaris*, in which the specific characters and very complicated synonymy of the two species of each genus which the author allows to stand, are carefully worked out.

For the rest, several of the newspapers of semi-scientific character give a fair space to game mammals, as they do to birds; *Forest and Stream* and the *Chicago Field* are to be specially mentioned in this connection. Among other subjects the question of hydrophobia from the bite of the skunk has occupied a prominent place; the contributions, however, being mostly the experiences of unscientific observers. It seems to be established: (1.) That skunk bite may produce a fatal disease undistinguishable from *rabies canina*, or ordinary hydrophobia; (2.) that skunk bite may be perfectly innocuous, and therefore, (3.) that hydrophobia from skunk bite only results under a rabid condition of the animal. No peculiarities of the case, as distinguished from that of a mad

dog or cat, appear to have been established, notwithstanding repeated assertions that skunk bite is always and necessarily fatal.

To the elucidation of fossil mammals the contributions of Mr. Marsh and Mr. Cope have been both numerous and important. If these still continue, as in former years, to represent the accumulation of material in the way of new genera and species, and the general enlargement of the view, rather than the attainment of final results based upon all the data acquired, they nevertheless include important discoveries and generalizations.

Foremost among these comes Mr. Marsh's discovery of Jurassic mammals in this country. The original announcement was made by Mr. Marsh in June, 1878, in the *American Journal of Science*, with description of *Dryolestes priscus* from the Atlantosauris beds of the Upper Jurassic, the associated fossils being mainly Dinosaurs.

To this succeeded, in July, 1879, the notice of *Stylacodon gracilis*, and in September, 1879, additional remains of Jurassic mammals were described as *Dryolestes vorax* and *Tinodon bellus*. It is interesting to observe, first, that the Jurassic genera indicate as many new families, and further, that they confirm Mr. Marsh's original determination of the Atlantosaurus beds as Upper Jurassic.

The same journal for June has also an interesting paper by the same on polydactyle horses, recent and extinct. It is illustrated with a plate of the genealogy of the horse, showing the modification of the limbs and teeth from *Orohippus* to *Equus*. This paper defines clearly, for the first time it is believed, the true difference between the orders none too aptly named Perissodactyla and Artiodactyla by Owen. The difference between the "odd-toed" and "even-toed" structure is stated to be "a profound one, extending to nearly every part of the skeleton, and marking two distinct groups of Ungulates. The number of toes has really nothing to do with the true distinction, and hence the terms in use are especially misleading. The real difference, so far as the feet are concerned, is, that in the Perissodactyle type the axis of the limb passes through the middle of the third digit (*Mesaxonia*), while in Artiodactyles it is outside of this digit (*Paraxonia*), between it and the fourth."

Mr. Cope's contributions to the same branch of the subject during 1879, will all be found in the publications of the Philadel-

phia Academy, of the American Philosophical Society, the AMERICAN NATURALIST, and the U. S. Geological Survey "Bulletin." The first of these has been already noted in connection with recent mammals. The NATURALIST contains many short papers, among which are: Extinct Mammalia of Oregon, p. 131 (in full in Bull. U. S. Geological Survey, No. 1, Feb. 28, p. 55-69); *Merycopater* and *Hoplophoneus*, p. 197; a new Anchitherium (*A. præstans*); A Decade of Dogs (five genera, ten species) p. 530; and the Cave Bear of California (*Arctotherium simum* sp. n.), p. 791.

Mr. J. A. Ryder, in the NATURALIST for September, notes a remarkable genus of sloths, *Grypotherium* Reinhardt, typical of a sub-family *Diarhinæ* and a species of *Cælodon* Reinhardt, 1878.

Mr. Cope's paper, above mentioned, in the Hayden Bulletin, describes for the Miocene Territories of Oregon: *Enhydrocyon* (g. n.) *stenocephalus*, *E. basilatus*, *Pœbrotherium sternbergii*, *Boëcharus* (g. n.) *humerosus*, *Lutricis lycopotamicus*, *Protolabis transmontanus*, spp. nn.

The same author's "Relations of the Horizons of Extinct Vertebrata of Europe and North America," in the same Bulletin, pp. 33-54, is doubtless his most important contribution, but it is one to which it is impossible to do justice in the present connection. His conclusions are:

"I. Portions of all the faunæ of all the primary divisions of geologic times have been recognized on both the European and North American continents.

"II. Parallels requiring general identification of principal divisions of these fauna may be detected. These are: the Coal measures; the Permian; the Laramie; the Mæstrichtian; the Eocene; the Miocene.

"III. Exact identifications of restricted divisions may be made in a few instances only; such are the Turonian and the Niobrara; the Suessonian and the Wasatch; the *Equus* beds and the Pliocene."

The Bulletin of the U. S. Geological Survey, Vol. v., No. 2, published September 6, 1879, has a paper by Mr. Cope, on the extinct *Rhinocerotidæ* of North America and their allies, which goes very fully into the characters of the group, giving new definitions of Perissodactyle families and genera, and describing many of the latter in detail, with analyses of various species.

The same paper is adapted to the *AMERICAN NATURALIST* for December, 1879, pp. 771*a-j*, with eight cuts.

Pages 798*a-b*, of *AMERICAN NATURALIST* for December, give in brief some of the more important results of Mr. Cope's recent trip to the Pacific coast, describing among other things the remarkable new fossil cats, *Archæolurus debilis* and *Hoplophoneus platycopis*.

Mr. Cope's Palæontological Bulletin, No. 31, being a "Second Contribution to a Knowledge of the Miocene Fauna of Oregon," "read before the American Philosophical Society, December 5, 1879," contains descriptions of the following new fossil mammals: *Hesperomys nematodon*, *Sciurus vortmani*, *Canis lemur*, *Chænohyus* (g. n.) *decedens*, *Thinohyus trichænus*, *Palæochærus subæquus*, *Coloreodon* (g. n.) *ferox*, *C. macrocephalus*. The date of printing is given as December 24, 1879.

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A REVIEW OF THE MODERN DOCTRINE OF EVOLUTION.¹

BY E. D. COPE.

THE doctrine of evolution of organic types is sometimes appropriately called the doctrine of derivation, and its supporters, derivatists. This is because it teaches the derivation of species, genera and other divisions, from pre-existent ones, by a process of modification in ordinary descent by reproduction. The opposite or creativist doctrine teaches that these forms were created as we see them to-day, or nearly so; and that the natural divisions and species of organic beings have never been capable of change, the one into the other.

I. The Evidence for Evolution.

The reasons which induce me to accept the derivatist doctrine, and to reject the creational, fall under the two heads of probabilities and conclusive evidence. The probabilities are cumulative in their pointings, and form part of a total body of evidence which is, to my mind, conclusive. The reasons why derivation is probable are the successional relation of increment or decrement of structure, observed in:

¹ Abstract of a lecture delivered before the California Academy of Sciences, Oct. 27, 1879.